# LUNG CANCER SUMMARY



## *INTRODUCTION*

*More than 3,100 Wisconsin residents were diagnosed with lung cancer and 2,660 residents died from lung cancer in 2000 (Table 1). Lung cancer is the second most common cancer among women (second to breast cancer) and men (second to prostate cancer) and is the leading cause of cancer deaths in Wisconsin. This paper summarizes information about primary lung cancer incidence, mortality, risk factors, prevention and current research.*

**Table 1. Lung Cancer Incidence and Deaths, Wisconsin 2000[A]**

| | Incidence* | Deaths |
|---|---|---|
| **Men** | **1,848** | **1,575** |
| **Women** | **1,311** | **1,085** |
| **Total** | **3,159** | **2,660** |

*Incidence is the number of newly diagnosed invasive lung cancer cases. (Invasive means the malignant tumor has invaded surrounding tissue or organs.)

Source: Wisconsin Cancer Reporting System, Bureau of Health Information and Policy, Division of Public Heatlh, Department of Health and Family Services.

## *WHO GETS LUNG CANCER?*

### General Incidence

Lung cancer is the second most common cancer occurring among both men and women in the United States and Wisconsin (1). In Wisconsin, lung cancer accounts for 12 percent of all new cancer cases. During 1996-2000, an annual average of 3,323 new cases of invasive lung cancer were reported to the Wisconsin Cancer Reporting System (WCRS) (2). Twenty-two percent of these cases were diagnosed at the early stage (local), 28 percent were diagnosed at the regional

[A] Incidence numbers (newly diagnosed cases) are based on the cases reported to the Wisconsin Cancer Reporting System as diagnosed in 2000. Deaths are from Bureau of Health Information and Policy files of resident death certificates, reflecting deaths that occurred in 2000.

stage, 41 percent were diagnosed at the distant stage, and 9 percent were reported as unknown in stage. The 1996-2000 Wisconsin average age-adjusted incidence rate for all invasive lung cancers was 62 per 100,000 population.[B]

**Incidence by Age, Sex, and Race**

*Smoking behaviors vary greatly by age, sex, and race. Therefore, smoking practices and history shape demographic differences in lung cancer. For example, the increased incidence of lung cancer that comes with increased age often reflects long-term smoking.*

**Age.** The incidence of lung cancer increases with age; 94 percent of lung cancers in Wisconsin occur among those 50 years of age and older (3). The American Cancer Society publishes national estimates for the general population's probability of developing lung cancer. At age 39 the probability is relatively low, approximately 1 in 3,347 among males and 1 in 3,187 among females. The probability increases dramatically with increasing age. For those aged 60 to 79, the probability for developing lung cancer is 1 in 17 for men and 1 in 25 for women (4).

**Sex.** Historically men experienced higher lung cancer incidence rates than women. However, this disparity has decreased during the last decade, largely as the result of increased smoking rates among women (5). In Wisconsin, lung cancer accounted for 15 percent of male cancers and 12 percent of female cancers in 2000. The Wisconsin incidence rates in 2000 were 77 per 100,000 among men and 44 per 100,000 among women (2).[B] The national incidence rates in 2000 were 80 per 100,000 among men and 50 per 100,000 among women (1).

**Race.** The North American Association of Central Cancer Registries (NAACCR) publishes cancer incidence and mortality data by race and sex. In Wisconsin for the years 1996-2000, there was a higher lung cancer incidence rate among African-American men and women than among white men and women.[C] African-American men had almost twice the incidence rate of white men, at 151 per 100,000 compared with 83 per 100,000, respectively. The incidence rate among African-American women was higher than among white women, at 62 per 100,000 compared with 48 per 100,000, respectively (6). According to the National Cancer Institute, the national lung cancer incidence rate in 2000 was 78 per 100,000 for African-Americans and 63 per 100,000 for whites (1).

## *WHAT ARE THE MORTALITY AND SURVIVAL FIGURES FOR LUNG CANCER?*

**General Mortality**

Lung cancer causes over one-fourth of all cancer deaths, more than any other cancer, as shown in Table 2. It accounts for over 26 percent of all cancer deaths in Wisconsin and 28 percent of all

[B] Incidence and mortality rates are per 100,000 residents, age-adjusted to the 2000 U.S. standard population. (The 2000 population is used as the standard by most state and national cancer organizations.) To calculate age-adjusted rates, age-specific rates are first determined, then weighted by multiplying each age-specific rate by the proportion of the 2000 U.S. standard population in that age group. The age-adjusted rate is the sum of the weighted age-specific rates.

[C] Due to limitations in population counts for races other than white and African-American, NAACCR does not publish age-specific rates for other racial/ethnic groups for Wisconsin.

cancer deaths in the United States each year. The 2000 age-adjusted Wisconsin mortality rate for lung cancer was 48 per 100,000 population.[B]

**Table 2. Leading Cancer Deaths, Wisconsin 2000**

| Women (% of total) | | Men (% of total) | |
|---|---|---|---|
| **Lung** | **22%** | **Lung** | **29%** |
| **Breast** | **16%** | **Prostate** | **13%** |
| **Colorectal** | **11%** | **Colorectal** | **10%** |

Source: Wisconsin Cancer Reporting System, Bureau of Health Information and Policy, Division of Public Health, Department of Health and Family Services.

**Mortality by Age, Sex, and Race**

*Apparent demographic differences in lung cancer death rates are influenced by differences in smoking behaviors and practices. For example, the higher mortality rate among men is attributable to higher rates of smoking.*

**Age.** Reflecting higher lung cancer incidence with age, 97 percent of Wisconsin lung cancer deaths occur among people aged 50 or older. Lung cancer deaths increase dramatically after age 50 and peak in the age group 70 –74; almost one-fifth (19 percent) of deaths are among this 5-year age group.

**Sex.** Men currently die from lung cancer at higher rates than women, largely as the result of higher smoking rates. The 2000 Wisconsin mortality rate was 67 per 100,000 among males compared with 35 per 100,000 among females (2). From 1990 to 2000, male lung cancer mortality in Wisconsin decreased 12 percent, while female mortality increased 13 percent. The national mortality rate for 2000 was 77 per 100,000 among males and 41 per 100,000 among females (1). Every year since 1987, more women in the United States have died of lung cancer than of breast cancer (4).

**Race.** In Wisconsin for the years 1996-2000, lung cancer mortality rates were higher among African-American men and women (130 and 46 per 100,000, respectively) than among white men and women (67 and 36 per 100,000, respectively)[C] The disparity is greater for males, as the mortality rate of African-Americans males is approximately twice that of white males (6). Data from the National Cancer Institute also show that nationally African-Americans were more likely to die of lung cancer in 2000 (64 deaths per 100,000 population) than were whites (56 deaths per 100,000 population). Nationally, the disparity in lung cancer mortality between African-Americans and whites is found only among males (102 compared to 76 deaths per 100,000) (1). The disparity in lung cancer mortality rates between African-Americans and whites is greater in Wisconsin than in the United States as a whole.

[B] Incidence and mortality rates are per 100,000 residents, age-adjusted to the 2000 U.S. standard population. To calculate age-adjusted rates, age-specific rates are first determined, then weighted by multiplying each age-specific rate by the proportion of the 2000 U.S. standard population in that age group. The age-adjusted rate is the sum of the weighted age-specific rates.

**Survival by Stage at Diagnosis**

In Wisconsin, less than one-fourth (22 percent) of lung cancers diagnosed in 2000 were detected at the early or local stage, 28 percent were detected at the regional stage, and 41 percent at the distant stage of disease. (Nine percent were unstaged.) These proportions have been relatively stable since at least 1990 (2). According to national data for the years 1992-1999 from the National Cancer Institute, only 16 percent of lung cancers were diagnosed at the early stage, 36 percent at the regional stage, and 38 percent at the distant stage. (Ten percent were unstaged.) (1)

When lung cancer is detected early (before it has spread to lymph nodes or surrounding organs) the average national five-year survival rate is 49 percent. Survival rates decline dramatically after lung cancer has spread to other organs: five-year survival is 16 percent for cases detected at the regional stage and 2 percent for cases found at the distant stage (1).

## *HOW HAVE LUNG CANCER INCIDENCE AND MORTALITY CHANGED OVER TIME?*

In Wisconsin and nationally, overall rates of lung cancer incidence and mortality have declined since 1990. However, lung cancer incidence and mortality rates among men declined steadily while rates among women continued to rise until the late 1990s.

**National trends.** The "Annual Report to the Nation on the Status of Cancer, 1975-2001" (by the Centers for Disease Control and Prevention, the American Cancer Society, and the National Cancer Institute) reported that lung cancer incidence and mortality rates among men have been declining since the early 1980s and 1990s, respectively. In women, incidence rates have declined since 1998 and mortality rates have stabilized since 1995, after increasing for several decades (7). These first signs of improvement appear to be an indication of national efforts to reduce cigarette smoking.

National lung cancer mortality rates among men decreased through the 1990s, by 1.7 percent per year since 1991 among white men and 2.5 percent per year since 1993 among black men. Since the early 1990s, the rate of increase in lung cancer death rates among women of all races slowed; however, rates still increased by 0.6 percent per year among white women and 0.8 percent per year among black women (7).

**Wisconsin trends.** Parallel to the national trends, from 1990 to 2000, Wisconsin lung cancer incidence rates declined every year among men and increased until 1998 among women. The male lung cancer incidence rate declined from 87 per 100,000 in 1990 to 77 per 100,000 in 2000. This reflects an 11.5 percent decrease over the decade, or a 1.1 percent decrease per year. In contrast, the female incidence rate increased from 39.5 to 44 per 100,000 or 11 percent, reflecting a 1.5 percent increase per year. However, in 2000 the rate among females (44 per 100,000) was lower than in 1998 (49 per 100,000).

The total lung cancer mortality rate in Wisconsin decreased by 3 percent, from 50 per 100,000 in 1990 to 48 per 100,000 in 2000. Mirroring the national trend, the male mortality rate declined steadily from 1990 to 2000 (from 76 to 67 per 100,000). The female mortality rate generally increased over the same period (from 31 in 1990 to 35 per 100,000 in 2000), but dropped from the peak rate in 1998 (38 per 100,000).

**Trends in stage at diagnosis and survival.** Lung cancer is not usually detected early because symptoms often do not appear until the cancer is advanced. In 2000, 22 percent of lung cancer cases in Wisconsin were diagnosed at the early stage (local); this percent has changed little since 1980 (2). Nationally, the National Cancer Institute reports only 16 percent of lung cancer cases were diagnosed at the local stage during 1992-1999 (the most recent published data) (1).

The national five-year survival rate for all lung cancer improved slightly, from 12.5 percent in 1975 to 15 percent in 1999. Survival for lung cancer is dependent on the stage of diagnosis: when detected at the local stage, five-year survival is 49 percent, at the regional stage, 16 percent, and at the distant stage, only 2 percent (1).

## *WHAT ARE THE RISK FACTORS FOR LUNG CANCER?*

The American Cancer Society defines a risk as anything that increases a person's chance of developing cancer. This means there is a greater chance of developing cancer for a person with the risk factor than for a person without the risk factor, but it does not predict which individuals will develop the disease.

**Tobacco smoking.** Tobacco smoking is the single most important risk factor for lung cancer. It is estimated that over 87 percent of lung cancers result from smoking. The risk increases with longer smoking history and with more packs of cigarettes smoked per day. Secondhand smoke is also a risk factor; for example, a non-smoker married to a smoker has a 30 percent greater risk of developing lung cancer than the spouse of a non-smoker. Lung cancer mortality rates are 22 times higher for current male smokers and 12 times higher for current female smokers compared to lifelong non-smokers (4).

The 2002 Wisconsin Behavioral Risk Factor Survey reported that 23 percent of Wisconsin adults were current smokers and 27 percent were former smokers (10). The 2001 National Health Interview Survey found that about 23 percent of U.S. adults (48 million) were current smokers, and 22 percent were former smokers (12).

U.S. death rates due to cigarette smoking rank among the highest in the world. According to the Centers for Disease Control and Prevention, smoking accounts for 440,000 deaths in this country each year. In addition to being responsible for 87 percent of lung cancers and 30 percent of all cancers, tobacco smoking is a major risk factor for heart disease, stroke, and chronic lung diseases such as emphysema. Smoking is also associated with cancers of the mouth, larynx, pharynx, esophagus, pancreas, uterine cervix, kidney and bladder (4).

For 2002, the Wisconsin Youth Tobacco Survey reported that 33 percent of Wisconsin high school students (grades 9-12) used tobacco in the preceding 30 days (12). The National Youth Risk Behavior Surveillance System (sponsored by CDC) also reported a 2001 smoking prevalence of 34 percent among all U.S. high school students (13).

**Differences by sex in susceptibility**. Some studies reported greater susceptibility to lung cancer among women than among men. Women were found to be more susceptible to tobacco carcinogens, to have a greater genetic predisposition for abnormal lung cell growth and generally more sensitive to tobacco-induced lung cancer (14, 15, 16). However, one of the largest studies to examine smoking patterns (based on the records of 60,000 women in the Nurses' Health Study and more than 25,000 men in the Health Professionals Follow-Up Study) recently found that

women were no more susceptible to lung cancer than men. Women and men with similar smoking patterns and comparable histories of smoking had similar rates of lung cancer (33).

**Exposure to radon.** The American Lung Association and the Surgeon General have warned that radon is the second leading cause of lung cancer in the United States (17). Long-term exposure to moderate or high levels of radon (a natural radioactive gas released from the ground) can lead to lung cancer. In certain areas, depending on local geology, radon enters buildings through cracks and holes in the foundation or can be released in the air from contaminated groundwater. According to the National Cancer Institute, radon is responsible for an estimated 10 percent of all lung cancer cases (18). The combination of smoking and exposure to radon gas is multiplicative and greater than either single risk. Elevated levels of radon can be detected by EPA-approved tests. Because radon gas is odorless and tasteless, testing is necessary to determine radon levels in homes.

**Exposure to asbestos.** The American Cancer Society reports that death from lung cancer is about seven times more likely among asbestos workers than among the general population, and at least 50 times more likely in asbestos workers who smoke (9). Some of the trades where workers may have been exposed to asbestos include shipbuilding, asbestos mining, manufacturing asbestos textiles, insulation work in construction and building trades, brake repair, building demolition and drywall installation. By U.S. law, asbestos is no longer used in new building construction, but older buildings still contain asbestos that could pose a danger. EPA estimates that 20 percent of all public buildings have some type of asbestos-containing material that is "friable" (likely to release fibers in the air). In older buildings (built before the 1970s) asbestos is frequently found in pipe insulation, joint compounds, floor tiles, linoleum, plaster and ceiling tiles. Exposure to asbestos in homes and public buildings poses much less danger than occupational exposure. Asbestos may not be considered harmful unless fibers are released by deterioration, demolition, or renovation.

**Other workplace carcinogens.** Workers and miners who are exposed to radioactive ores such as uranium and chemicals such as arsenic, vinyl chloride, nickel chromates, coal products, mustard gas, and chloromethyl ethers are at higher risk for lung cancer (9).

**Marijuana.** Marijuana cigarettes contain levels of tar equal to or greater than tobacco cigarettes, and many of the same carcinogenic substances. However, any connection between marijuana and lung cancer is difficult to establish because marijuana is illegal, and many marijuana users are also cigarette smokers (9).

**Lung disease.** Tuberculosis and some types of pneumonia leave scarred lung areas, which increase a person's chance of developing certain kinds of lung cancer. Silicosis and beryliosis, lung disease caused by breathing certain minerals, also result in an increased risk for lung cancer (9).

**Personal and family history.** People with lung cancer have an increased risk of another lung cancer. Relatives of lung cancer patients also have a slightly higher lung cancer risk, but this may be due to environmental tobacco smoke (9).

**Air pollution.** In large cities or cities with high levels of industrial pollutants, the risk of lung cancer may be slightly increased (9).

**Diet.** Some studies have found that a diet low in fruits and vegetables may increase the chances of cancer when combined with tobacco use (19). The flavonoids found in fruits and vegetables, as well as green tea, may have a protective effect (23).

## HOW CAN LUNG CANCER BE PREVENTED OR CONTROLLED?

### Prevention – Lifestyle Choices

**Stop or never start smoking.** The best way of prevent lung cancer is to quit smoking. Since 1964, when the landmark "Smoking and Health" report from the Advisory Committee to the Surgeon General clearly linked lung cancer and tobacco use, health professionals have agreed that the most effective way to lower the risk of lung cancer is to never smoke, or to stop if currently smoking. Because symptoms of lung cancer often do not appear until advanced stages of the disease, smoking cessation is the single most important national strategy in the prevention of lung cancer.

Low-tar cigarettes have not proven to lower smokers' risk according to a study conducted by the Massachusetts Institute of Technology and the American Cancer Society (20). Smoking fewer cigarettes or "cutting back" was also found to provide less benefit than would be expected. The level of carcinogens the smokers inhaled didn't drop in proportion to the cutback in smoking, perhaps because smokers may inhale more deeply and slowly to compensate. The number of years spent smoking is viewed as more important than the number of cigarettes smoked per day (21). These findings support the prevailing medical evidence that quitting smoking is the only effective way to reduce the risk of lung cancer.

As a financial incentive to stop smoking, the U.S. Internal Revenue Service issued a ruling in 1999 that allows a tax deduction for the cost of smoking cessation programs offered by hospitals and other treatment centers, and the cost of prescribed drugs for smoking cessation.

While smoking is by far the greatest cause of lung cancer, some research suggests the following measures may play a role in long-term health related to lung cancer prevention:

**Fruits and vegetables.** Dietary recommendations for the prevention of all types of cancer have emphasized the value of consuming a variety of fruits and vegetables. The National Research Council, the American Cancer Society, the National Academy of Sciences and the National Cancer Institute have made recommendations for the dietary prevention of cancer and have found a clear preventive benefit from high consumption of fruits and vegetables (22, 23). A variety of studies have shown an inverse relationship between fruit and vegetable intake and lung cancer. The Nurses Health Study found a 21-32 percent lower risk of lung cancer in those with the highest fruit and vegetable consumption (24). Data from Hawaii showed lower rates of lung cancer with higher consumption of foods rich in certain flavonoids (25).

**Tests for work, home and school environments.** Radon and asbestos pose threats to health by increasing the risk of lung cancer and other lung diseases. In areas known to have uranium deposits, or where radon is suspected, radon testing is advisable. The U.S. Environmental Protection Agency (EPA), the Surgeon General, the American Lung Association, the American Medical Association, and the National Safety Council all recommend testing homes for radon. Since 1986 the EPA has required schools to develop management plans to control asbestos-containing materials. While not required for other types of buildings, asbestos inspections are frequently recommended for older buildings, generally those built before the 1970s (26). Older

buildings, built in the 1930s through the1960s, are more likely to contain asbestos materials and insulation, and special tests can detect the presence of deteriorating and potentially dangerous asbestos. State and local offices of the EPA can provide the names of companies that conduct radon testing and remediation, as well as asbestos management or containment.

**Screening Guidelines from National Cancer Organizations**

Screening is the use of medical tests to detect disease in people without known symptoms of that disease. Current guidelines from the American Cancer Society and the National Cancer Institute do not recommend routine chest X-rays for the general public, or even for smokers. The absence of screening recommendations is based on large studies, such as three studies conducted by the Mayo Clinic, Johns Hopkins University and Memorial Sloan-Kettering Cancer Center from 1971 to 1982, that found no reduction in lung cancer mortality among screened groups (27). Lung cancer has changed in type during the last 30 years. The most common type since the early 1990s has been adenocarcinoma, whereas in the 1960s and 1970s the most common type was squamous cell. Adenocarcinoma is located more peripherally in the lungs and may be more detectable by chest X-rays (28).

**Methods of Detecting and Diagnosing Lung Cancer**

**Imaging tests.** X-rays, computed tomography (CT scans), magnetic resonance imaging (MRI) and several other imaging techniques are used to create pictures of the inside of the body. The chest X-ray is usually done first to look for any mass or spot on the lungs. Several imaging tests may be used to determine where lung cancer has spread in the body.

**CT scans offer earlier detection but have not proven to improve survival.** The 1999 Early Lung Cancer Action Project (a screening study of 1,000 subjects, both smokers and non-smokers), was conducted by researchers at Cornell University, New York University Medical Center, and McGill University in Montreal. This study found that CT scans, compared with conventional X-rays, improved the detection of early-stage lung cancers (29). Malignant tumors were detected six times more frequently than with X-rays. However, finding lung cancer early has not been shown to improve survival. A Duke University study of small (3 cm. or smaller) lung tumors found no evidence that early detection by CT scanning slowed the course of lung cancer (30). The largest study to date, the National Lung Cancer Screening Trial, is being conducted by the National Cancer Institute. Launched in 2002, the study enrolled 50,000 current or former smokers, randomized subjects to receive either a chest X-ray or a CT scan each year for three years, and will monitor their health status through 2009. This is the first national trial to compare the traditional chest X-ray and the newer spiral CT scan for the extent of reduction in lung cancer mortality (31). More than 50 percent of hospitals have spiral CT scanners, most often used to determine the stage of cancer after diagnosis. Some hospitals offer CT scans as a new way to find early lung cancer but the technology is still new and the benefit to survival has not been proven.

**Medical biopsies.** Biopsies are conducted to examine a tissue sample from a mass in the lung under the microscope to see if cancer cells are present. A biopsy is necessary for the doctor to confirm a cancer diagnosis, and to identity the specific type of lung cancer and its stage. Needle biopsies, mediastinoscopy, bronchoscopy, and bone marrow biopsies all remove samples to check for cancer cells under the microscope (32).

**Sputum cytology.** A sample of phlegm is examined under a microscope to see if cancer cells are present (32).

**Blood tests.** Specific blood tests are done to detect whether lung cancer has spread to the liver or bones and to help diagnose certain syndromes. Examples of syndromes are Horner's Syndrome and paraneoplastic syndromes, in which lung cancer cells produce hormones or other substances that enter the blood and affect distant tissues and organs (32).

## *WHERE TO FIND MORE INFORMATION*

National Cancer Institute Cancer Information Service Telephone: 1-800-4-CANCER

National Cancer Institute Cancer Net Website: http://cancernet.nci.nih.gov

American Cancer Society Telephone: 1-800-ACS-2345
Website: http://www.cancer.org

Alliance for Lung Cancer Advocacy, Support, and Education:
http://www.alcase.org

American Lung Cancer Association Facts about Lung Cancer
http://www.lungusa.org/diseases/lungcanc.html

Centers for Disease Control and Prevention
Tobacco Information and Prevention Source (TIPS)
http://www.cdc.gov/tobacco

Cancer Links - Lung Cancer Guide
http://www.meds.com/lung/guide/u_index.html

Cancer News on the Net - Lung Cancer
http://www.cancernews.com/lung.htm

Harvard Center for Cancer Prevention
http://www.hsph.harvard.edu/cancer

Mayo Clinic Cancer Library
http://www.mayohealth.org

Johns Hopkins Oncology Center
http://www.hopkinskimmelcancercenter.org

University of Pennsylvania Cancer Center- Oncolink
http://cancer.med.upenn.edu

Wisconsin Cancer Reporting System
http://dhfs.wisconsin.gov/wcrs/index.htm

Wisconsin Tobacco Control Program
Division of Public Health
http://dhfs.wisconsin.gov/health/TobaccoControl

University of Wisconsin Comprehensive Cancer Center
http://www.cancer.wisc.edu

United States Environmental Protection Agency
http://www.epa.gov

***DEFINITIONS***

**Age-adjusted rate** – The incidence and mortality per 100,000 population expected for Wisconsin if the state's age distribution were the same as that of the standard population. For incidence and mortality in this report, the standard population used was the 2000 U.S. population. Age-adjusted rates allow comparisons between different population groups by controlling the effects of age differences between populations

**Cancer** – A group of diseases characterized by uncontrolled growth and spread of abnormal cells. If the spread is not controlled, it can result in death.

**Cancer diagnosis** – The detection of cancer based on screening and diagnosis tests that confirm the presence of cancer cells. Primary diagnoses are based on the cancer site of origin. For example, a cancer originating in lung tissue is diagnosed as lung cancer, even if it has spread to other parts of the body. (Cancers that spread to the lungs from other sites are therefore not considered primary lung cancers.) This report presents information about primary lung cancers.

**Cancer screening** – Checking for changes in tissues, cells or fluids that may indicate the possibility of cancer when there are no symptoms. Regular screening exams can result in the detection of some cancers at earlier stages, when treatment is more likely to be successful.

**Cases** – The incidence of a reportable primary site of origin for cancer. A cancer patient may be diagnosed with more than one primary cancer. The number of cases in this report refers to the number of primary cancers, not the number of cancer patients

**Cause** - Cancer is caused by both external factors (chemicals, radiation, and viruses) and internal factors (hormones, immune conditions, and inherited mutations). Causal factors may act together or in sequence to initiate or promote cancer. Ten or more years may pass between exposures and detectable cancer.

**Invasive cancer** - Malignant cancer or tumor that has invaded tissue or surrounding organs. Invasive cancer includes local, regional and distant stages of disease at the time of diagnosis.

**Rate** – The number of events occurring in a specific population during a given period of time. Rates in this report are expressed per 100,000 population.

> **Incidence rate** – The number of new cancer cases of a specific site occurring in a specified population during a year, expressed as the number of cancers per 100,000

population. It should be noted that the numerator can include multiple cancer sites occurring in one individual and, except for in situ bladder cancer, excludes in situ cases. All incidence rates in this report are standardized to the 2000 U.S. population.

**Mortality rate** – The number of deaths with cancer given as the underlying cause of death occurring in a specific population during a year, expressed as the number of deaths due to cancer per 100,000 population. All mortality rates in this report are standardized to the 2000 U.S. population.

**Risk factor** – Something that increases a person's chance of developing a disease. Having a risk factor means a person has a greater chance of developing a disease than a person without the risk factor, but it does not predict with any certainty those who will develop a disease.

**Stage of disease at diagnosis** – The stage of disease at diagnosis refers to the extent of the spread of disease at the time of diagnosis. The staging classification used in this report is the National Cancer Institute's Summary Staging Guide for Cancer: Surveillance Epidemiology and End Results Reporting. The summary stages are defined as follows:

In Situ – A tumor that fulfills the microscopic criteria for cancer, but does not invade the surrounding tissues. This paper does not include in situ cases, but reports only invasive cancers. Most cancer publications exclude in situ cases, except for in situ bladder cancer.

Local – A malignant tumor that is confined to the organ of origin with no evidence of spreading to other parts of the body.

Regional – A malignant tumor that has spread beyond the limits of the organ of origin into adjacent organs or tissues by direct extension, or through regional lymph nodes, but appears to have spread no further.

Distant – A malignant tumor that has spread to parts of the body remote from the organ of origin.

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